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3 Do Firms Care Who Provides Their Financing?

Jeffrey K. MacKie-Mason

Most capital structure studies have focused on the type of financial liabilities that firms use to finance their investment.[1] As noted by Robert Taggart, Jr., "primary attention is devoted to corporations' relative use of debt and equity financing. This has been the focal point of most previous attempts to trace patterns in corporate financing and of capital structure theory as well" (1985, 15). The purpose of this paper is to investigate whether firms care from *whom* they get their funds, in addition to caring about the *type* of funds. Finding that firms do distinguish between private and public, internal and external sources of funds, would help to explain the widely documented effect of cash flow on investment. More generally, if firms care about who provides a given type of funds, then credit market conditions are likely to have wide-ranging effects on many types of economic activity.

To address these questions I document aggregate and industry trends and patterns in the incremental sources of financial capital, and then I econometrically analyze a large sample of incremental corporate financial decisions. I find that there are large and persistent differences in the patterns of internal and external financing, both in the aggregate and across industries. The study of financing choices by individual firms shows that firms prefer particular providers of funds under various circumstances. Asymmetric information problems appear to be important determinants of financing choices. Since dif-

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ferent funds providers have different access to information about the firm and different ability to monitor firm behavior, the importance of asymmetric information gives a reason for firms to care about who provides the funds.

Attention to the costs of asymmetric information led Stewart Myers (1984) to propose a "modified pecking order theory" of financing decisions. In this view, firms tend to have hierarchical preferences over sources of funds, first using retained earnings, then private and public debt if necessary, and finally new shares only as a last resort. However, Myers believed that firms would also consider other costs and benefits of debt and equity finance (such as tax advantages). Sometimes a firm will find that other benefits outweigh asymmetric information costs and will choose a funds source lower on the hierarchy than necessary. The results in this paper are consistent with this eclectic view. Firms are seen to care about *who* is providing the money, apparently because asymmetric information problems are important. But there is also evidence that at least some of the time firms calculate the trade-offs between debt and equity *types* of funding as if they were seeking an optimal debt ratio.

In the first section I briefly review some of the major theories of capital structure decisions, emphasizing the distinction between theories that have predictions for the type of security (debt or equity) a firm chooses and those that predict preferences for different types of providers (publicly-marketed or private). In Section 3.2 I present aggregate data on pattems in sources of financial capital, and in Section 3.3 I disaggregate the financing trends into broad industry groupings. There emerges the striking fact that there are persistent trends in the aggregate and differences in financing pattems across industries that cannot be explained if firms care only about the type of financing and not who provides it. This evidence supports the hypothesis that there are important distinctions between types of providers in addition to the distinction between types of funds.

The macro evidence motivates the econometric analysis of individual firm decisions in the second part of the paper. In Section 3.4 I develop a choice model for incremental decisions by individual firms and describe the selection of explanatory variables. The econometric results are presented in Section 3.5.

3.1 Theories of Financing

In this section I distinguish between two major themes in the literature on corporate financing and emphasize the different predictions that emerge from them.[2] The traditional view is that firms consider the costs and benefits of debt and equity then choose an optimal leverage ratio. The more recent view emphasizes costs associated with different providers of funds, rather than with the type of funds provided. It is the latter type of model that provides the central focus of this paper.

The two schools of thought are not mutually exclusive, although almost no

theoretical work has appeared that integrates them.[3] I describe them separately not to challenge one with the other, but to highlight the common and distinguishing predictions they make. The data and econometric analysis presented below establish a number of empirical regularities that cannot be explained by the traditional optimal leverage theories. However, the other view—that who provides the funds matters—predicts several of the regularities that I find.

3.1.1 Different Security Types

Most of the financing literature has been concerned with the use of different types of security contracts for funding. Sources of funds can be thought of as contingent claims on the firm's cash flows, with different contingencies distinguishing between types of financing. The best-known examples are simple debt and common equity: debtholders have a senior claim on the firm's cash flows up to a fixed amount, and the equity owners receive the residual. If the firm is unable to meet the fixed interest commitment, the remaining assets are turned over and the equity claims become worthless.

If managers try to maximize shareholder wealth, then new investment should be financed with debt or equity depending on which contributes most to the firm's present value. Three aspects of the different debt and equity contingencies are usually emphasized as benefits and costs for debt and equity: (1) more debt increases the likelihood of bankruptcy, which may impose real wealth costs on shareholders; (2) more debt may distort incremental investment incentives, reducing firm value by the inefficiency cost; and, (3) the government takes different shares of cash flows to debt and equity. These effects are specific to the type of security—that is, the specific contingencies that define the security—and thus have no particular implications for who should provide the funds.

Financial distress and bankruptcy are usually presumed to cause real reductions in shareholder wealth (Miller and Modigliani 1966). Since greater fixed interest obligations increase the probability of financial distress, a firm should use less debt the higher are the expected bankruptcy costs.

A related cost of debt financing is that the fixed interest commitment may distort the managers' incentives for future investment decisions, thus reducing the value of the firm's wealth-increasing opportunities. Firms with large debt burdens may take on projects that are too risky because the shareholders gain if the projects succeed but the debt holders lose if the projects fail (Jensen and Meckling 1976). Myers (1977) and MacKie-Mason (1987) present models in which debt leads to underinvestment in future opportunities because prior interest commitments have first claim on the cash flows from the new project, thus reducing the likelihood that the project will yield a return on its incremental investment cost.

Tax claims also impose benefits and costs on security types. The most important rule is that interest paid is tax deductible for corporations while dividends paid are not. Thus debt financing would appear to be substantially

favored, with a horizontal supply curve at the interest rate that equates the after-tax cost of financing with debt and equity. However, Miller (1977) pointed out that the corporate tax advantage to debt could be offset by personal tax disadvantages. He argued that a clientele would form for each firm's securities of investors whose tax rates made them indifferent to the firm's mix of debt and equity payouts, by equating rates of return after corporate and personal taxes. In Miller's model taxes have no effect on the choice of security type.

DeAngelo and Masulis (1980) studied a flaw in the Miller (1977) argument: additional interest commitments reduce the probability that the firm will be paying taxes, and in a zero-tax status the firm loses the benefits of other, non-debt tax shields. Thus, the firm is likely to have an upward-sloping debt supply curve and should have an optimal leverage ratio determined by the intersection of the supply curve and the investor-clientele demand curve.

3.1.2 Different Providers of Funds

A manager's valuation of a claim on a firm's future cash flows depends on what she expects about the firm's future performance. Managers seeking to maximize the wealth of current shareholders will only sell securities if investors are willing to pay as much or more than the managers—given their expectations—believe the securities are worth. Investors determine willingness to pay based on *their* expectations for the future. Investors who believe a firm's prospects are good will offer more than pessimists. The firm will care about who provides the funds because different providers will have different information and expectations, and thus be willing to pay different amounts for the securities.

Suppose managers have better information, and thus more accurate expectations, about the firm than do outside investors. I shall refer to this as the problem of hidden information. Hidden-information problems have quite different predictions for sources of financing than do the optimal leverage discussed above. Hidden-information problems have been proposed as a reason for firms to have hierarchical preferences over various sources of finance by Myers (1984). I place the emphasis somewhat differently: hidden-information problems predict firm preferences over providers of funds but not security types, while the optimal leverage factors affect choice of security types but not of provider funds. This dividing line is oversimplified, but it provides a useful organizing point for the investigation in this paper.

The basic prediction of the hidden-information theory is that investors who believe they have poorer information than managers will pay less for new securities than will better-informed investors. The intuition is simple: since managers sell securities only if buyers are willing to pay as much or more than the managers believe the securities are worth, poorly informed investors will assume that they are being exploited.

This story is a version of the well-known "lemons" model and has been

formalized for new share issues by Myers and Majluf (1984). A similar phenomenon can lead to certain investors rationing the amount of financial capital they are willing to provide. Stiglitz and Weiss (1981) present a model in which banks ration credit to various firms because the banks cannot completely distinguish between good and bad firms. At some point no more funds will be offered regardless of the interest rate the firm is willing to promise because of the risk that the firm is a lemon.

Thus firms will prefer to obtain funds from investors who are better informed and do not require as large a premium. For example, firms will prefer to use retained earnings over new share issues: retained earnings are reinvested equity by current shareholders, so there is no possibility for information exploitation to transfer wealth from new investors to existing owners.[4] Likewise firms might prefer borrowing from their regular commercial bankers rather than from publicly marketed bonds if the banker has better access to relevant information (or can verify it more cheaply) than do bond purchasers.

We thus expect that firms care about who provides their financing. In general such asymmetries of information are not related to the *type* of security, and as such do not predict financing preferences over debt and equity *per se*.

3.1.3 Summary

The general predictions of the two views are summarized in table 3.1. Debt/equity choices should depend on tax shields because of crowding out by new interest deductions. The composition of a firm's assets between fixed capital in place and future investment opportunities affects the cost of debt because of the possibility of inefficient future investment decisions. And, firms with a high likelihood of bankruptcy may avoid new debt rather than increase the expected realization of financial distress costs. For the most part these factors are not important for the choice between different providers of funds.

The main predictions of the hidden information view are that firms will seek better-informed investors when the perceived likelihood of a hidden-information advantage is high or when the potential difference in valuations due to hidden-information is high. For example, the probability of financial

Table 3.1 **Predicted Effects of Financing Choice Determinants**

	Predicted to Have an Effect On	
Potential Determinants	Type of Security	Type of Provider
Tax shields	yes	no
Asset composition	yes	no
Bankruptcy likelihood	yes	maybe
Paying dividends	no	yes
Forecast variance	maybe	yes
Public regulation	no	yes

distress *per se* is not a hidden-information problem if that probability is common knowledge, but the costliness of small information differences is likely to be magnified for a firm near bankruptcy, leading to an indirect effect of potential financial distress on preferences over providers of funds. Thus I have put a "maybe" in the table in that cell.

The other characteristics in table 3.1 are predicted to influence choice of provider, but not type of security. We need to look for publicly observable factors that are likely to indicate significant divergences in information or its value, without actually knowing what hidden information the managers have. For example, if firms pay dividends as a costly and informative signal to reveal hidden information, then hidden information may be a bigger problem for firms that do not pay dividends. When the forecast variance of a firm's earnings is high, a small amount of asymmetric information may be reflected in a big difference between earnings predictions by managers and investors. On the other hand, firms with government rate regulation have much relevant information revealed and validated for investors by the regulatory body. Rate regulation also might intentionally dampen the effects of good or bad surprises.

Specific variables to measure these effects shall be discussed in Section 3.4 below. First, in the next two sections I investigate the trends and patterns in sources of funds in the aggregate and across industries. If firms care only about debt and equity choices, then we should see more or less random variation in the degree of reliance on various providers of funds. Of course this prediction is too strong, and a microeconomic analysis of individual firm financing is necessary if we are to draw strong conclusions. However, from a look at the macro data we shall see important trends and cross-industry variation in reliance on different providers of funds as distinct from different types of securities. These results motivate and reinforce the later analysis of firm decisions.

3.2 Aggregate Sources of Funds since World War II

In this section I present data on sources of funds for the nonfinancial corporate sector since 1945 and discuss the apparent patterns at the aggregate level.[5] These data introduce some of the empirical regularities that will be examined in the econometric analysis of financial choices. Sources of funds are presented as a percentage of total sources in table 3.2. The data are averaged over business cycles (measured from trough to trough, using the nearest quarter) to control for cyclical effects.[6]

Before studying the different patterns in various incremental sources of funds, two broad facts illustrated in figure 3.1 deserve notice. First, the profit flow out of the nonfinancial corporate sector has been very close to zero. That is, predistribution earnings have averaged 97% of total sources of funds, and have rarely strayed far from 100% (table 3.2). Since earnings represent net

Table 3.2 **Sources of Funds, by Business Cycle (% of Total Sources)**

	Business Cycle									
	45Q4–49Q4	49Q4–54Q2	54Q2–58Q2	58Q2–61Q1	61Q1–70Q4	70Q4–75Q1	75Q1–80Q3	80Q3–82Q4	82Q4–87Q4	Total
Net dividends	28.9	26.8	27.6	27.5	24.3	19.1	19.9	21.1	19.8	23.7
Retained earnings	68.4	68.7	78.4	79.9	73.7	62.0	74.8	72.7	77.6	73.1
Predistribution earnings	97.3	95.4	105.9	107.4	98.0	81.1	94.7	93.8	97.3	96.8
Bank loans	6.9	6.2	5.5	3.7	8.2	11.1	4.1	10.5	5.5	6.8
Mortgages	6.2	3.5	4.6	6.7	3.9	4.0	.3	−4.1	.4	3.1
Trade debt	3.4	−3.9	−2.6	−4.3	−1.8	−2.2	−4.1	3.8	−1.8	−1.8
Other debt	−.3	.8	.6	1.8	2.1	4.0	7.2	8.9	8.3	3.5
Corporate bonds	12.4	11.1	10.9	9.9	11.1	11.2	10.8	6.2	16.0	11.4
Total debt	28.6	17.7	19.1	17.9	23.4	28.1	18.3	25.3	28.3	22.9
New shares	5.3	6.3	5.4	4.2	2.0	6.5	2.4	−.6	−12.8	1.8
Miscellaneous sources	−2.4	7.4	−2.8	−2.0	.9	3.4	4.4	2.6	6.9	2.2
External sources	31.6	31.3	21.6	20.1	26.3	38.0	25.2	27.3	22.4	26.9
Total sources	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: Federal Reserve, *Flow of Funds Accounts,* various issues, 1945–87.
Note: Business cycle troughs are indicated by quarter (Q), but the data are averages of calendar years, split at the closest point to the trough.

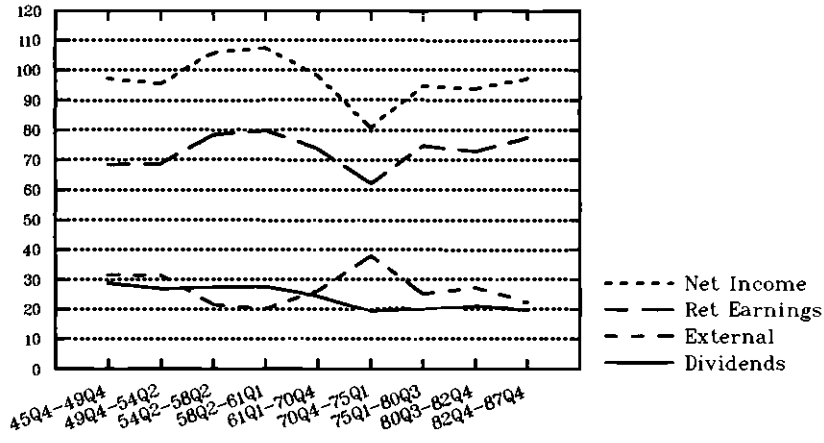


Fig. 3.1 Internal versus external funds (% of total sources)

income after interest payments on debt, the net total flow of financial payments out of the corporate sector has been consistently close to nominal interest payments on debt. Why does the corporate sector maintain a debt level such that investment is almost identical to after-interest earnings?

The second intriguing fact concerns the well-known dividend puzzle. Dividends are a tax-disadvantaged means for transferring funds from the corporate to the household sector. One obvious altemative is to repurchase shares. In fact, firms recently have begun to repurchase huge amounts of equity, but dividends have not declined correspondingly. Although the long-run trend is slightly negative, dividends have been almost a constant share of total sources since 1970, even as new shares have plummeted from 6.5% of total sources over the fourth quarter of 1970 through the first quarter of 1975 (70Q4–75Q1) to − 12.8% in the most recent cycle. It seems that corporations have discovered share repurchases but have not been using them to reduce dividends, at least in aggregate.[7]

Details on the major sources of funds are presented in table 3.3. I distinguish between four major sources: retained earnings, nonpublicly marketed debt, corporate bonds, and new equity share issues. This paper focuses on two dimensions of financing: private versus publicly marketed financing, and debt versus equity financing. Some data on intemal versus extemal sources of funds are also presented. Retained earnings are the only intemal source; retained earnings plus private debt constitute private sources.

3.2.1 Intemal versus Extemal Sources

Intemal and extemal funds are shown in figure 3.1. Over the entire period nearly three-quarters of funds were provided intemally (table 3.2). The reliance on intemal funds fluctuates somewhat but the variance is low. If the stag-

Table 3.3 Internal and External Financing, 1946–1987 (% of Total Sources)

Year	Retained Earnings	Private Debt	Corporate Bonds	New Shares	Payout Ratio
1946	50.2	50.2	6.1	6.4	39.4
1947	57.7	13.1	12.9	5.0	31.7
1948	72.0	4.1	16.6	3.9	25.6
1949	93.9	−2.6	14.1	5.9	25.0
45Q4–49Q4	68.4	16.2	12.4	5.3	30.4
1950	56.1	10.8	5.1	4.1	30.7
1951	60.5	8.3	10.1	6.5	28.2
1952	82.1	3.7	17.2	8.5	26.7
1953	75.9	3.5	12.0	6.0	27.3
49Q4–54Q2	68.7	6.6	11.1	6.3	28.2
1954	92.4	.2	13.4	6.0	26.5
1955	68.4	11.0	6.9	3.9	25.0
1956	76.4	13.5	8.8	5.7	26.5
1957	76.3	8.2	14.4	5.8	25.8
54Q2–58Q2	78.4	8.2	10.9	5.4	26.0
1958	85.6	.1	15.8	5.5	26.4
1959	71.3	13.3	6.0	4.1	24.4
1960	82.8	10.5	7.9	3.2	25.7
58Q2–61Q1	79.9	8.0	9.9	4.2	25.5
1961	77.0	5.8	9.2	4.4	25.9
1962	77.0	12.8	7.2	.7	24.4
1963	75.5	16.1	6.1	−.5	24.4
1964	79.7	11.2	6.1	1.7	24.3
1965	74.4	16.3	6.1	−.0	24.2
1966	73.1	13.0	11.8	1.5	23.6
1967	74.2	10.8	16.9	2.8	24.2
1968	68.9	14.0	13.5	−.2	25.4
1969	70.0	15.7	12.8	3.7	25.9
1970	67.3	7.8	21.2	6.1	26.2
61Q1–70Q4	73.7	12.3	11.1	2.0	24.9
1971	65.9	4.4	16.6	10.1	23.5
1972	68.0	12.0	9.6	8.6	22.3
1973	53.3	33.2	5.2	4.5	22.6
1974	60.9	17.8	13.4	2.8	25.7
70Q4–75Q1	62.0	16.8	11.2	6.5	23.5
1975	82.1	−7.4	17.9	6.5	19.9
1976	72.5	3.8	11.7	5.4	20.3
1977	74.1	13.0	10.3	1.2	20.3
1978	70.7	16.0	8.2	−.0	20.7
1979	77.2	12.4	6.8	−3.1	21.5
1980	72.3	7.2	10.0	4.7	23.4
75Q1–80Q3	74.8	7.5	10.8	2.4	21.0
1981	68.2	23.7	6.5	−3.3	22.0
1982	77.3	14.4	6.0	2.0	22.9
80Q3–82Q4	72.7	19.1	6.2	−.6	22.5

(continued)

Table 3.3 (continued)

Year	Retained Earnings	Private Debt	Corporate Bonds	New Shares	Payout Ratio
1983	74.6	10.0	4.2	6.1	21.5
1984	75.6	24.5	10.4	−16.8	19.4
1985	81.5	15.3	17.1	−18.8	19.3
1986	73.1	10.7	24.8	−16.5	20.1
1987	83.0	1.2	23.5	−18.0	21.3
82Q4–87Q4	77.6	12.3	16.0	−12.8	20.3
All years	73.1	11.5	11.4	1.8	24.5

Source: Federal Reserve, *Flow of Funds Accounts.*

flation- and OPEC-dominated cycle from the fourth quarter of 1970 to the first quarter of 1975 (70Q4–75Q1) is dropped, the internal/external ratio is extremely stable.

There is no evidence of any long-run trend in internal financing. This finding contradicts Taggart's conclusion that "internally generated funds have also declined relative to total sources during the postwar period" (1985, 28). Taggart examined data through 1979; his conclusion might have been due in part to the abnormally low use of internal financing during 1971–75.[8] Since 1975, retained earnings have hovered around the postwar average of 73%. During the last six years the internal fraction has ranged from 73% to 83%, but those years comprise only the expansion part of the strongest economic boom since 1945.

The dominance of internal equity funding is one of the stylized facts that prompted Myers (1984) to contemplate a hierarchy theory of corporate financing, with retained earnings the most preferred source. Hierarchical preferences follow from some asymmetric information problems. However, firms might prefer internal funds over new shares because of transactions costs and the tax penalty on dividends. Thus observing a high share of internal equity funding need not indicate whether a firm has hierarchical preferences for internal funds over debt. We need to examine the data more carefully before drawing conclusions about the existence of financing hierarchies.

3.2.2 Private versus Public Sources

Another distinction between sources of funds is whether the funds are raised in a public, competitive market. The alternative, which I call "private" sources, is to use retained earnings or debt sold through private placements or negotiated directly with a bank. The shares of private and public sources of funds are shown in figure 3.2. Publicly marketed sources are defined as net new share issues and corporate bonds. Private sources include retained earnings, bank loans, finance company loans, mortgages, and a variety of miscellaneous (but generally small) sources such as taxes payable and net trade debt.

One point appears obvious from the figure: the corporate sector is turning steadily away from public sources of funds. However, we must look separately at the trend components, shown in figure 3.3. Although net public financing has dropped from nearly 20% of total sources during the 1970–75 cycle to almost 0% during the most recent years, the result is entirely due to the strong downward trend in new equity shares. In fact, during seven of the last 10 years net new share issues have been negative (*i.e.*, there have been net repurchases). During 1982–87 new shares have averaged −12.8% of total sources.

Although net public financing has fallen almost to zero, firms are still turn-

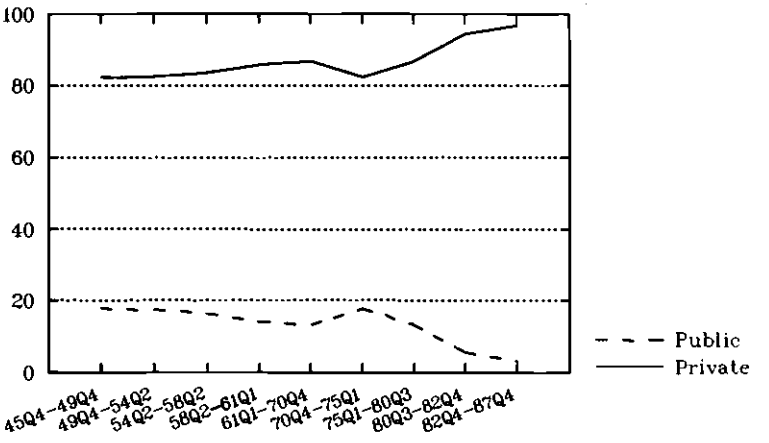


Fig. 3.2 Private versus public sources (% of total)

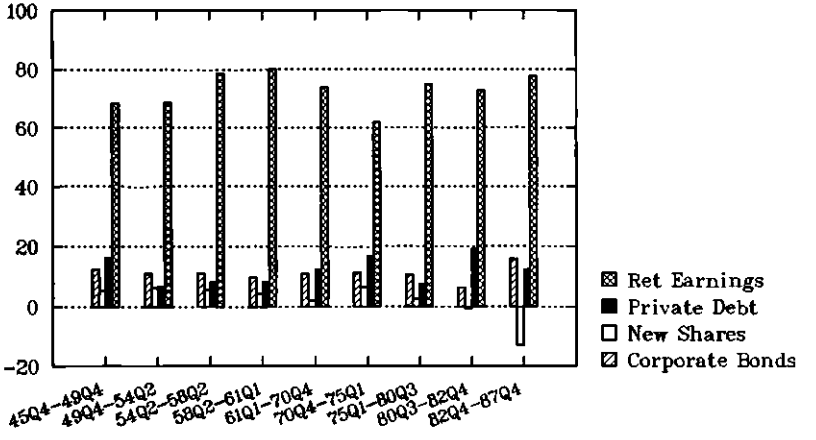


Fig. 3.3 Major sources of funds (% of total)

ing to the public bond market for substantial funds. As seen in figure 3.3, corporate bond financing has been steadily around 10% since 1946. There was a substantial drop during the short 1981–82 cycle, but public bond financing has been significantly above average during the last few years. Thus there is not a consistent trend away from *public* sources of funds; rather there is a trend away from new shares. This observation might be consistent with a financing hierarchy that has new shares as the least-preferred form of finance. On the other hand, if firms have a strong aversion to issuing new shares, we might expect them to invest available cash in liquid financial assets rather than in repurchasing their own shares, building up reserves to reduce the likelihood of needing to issue new shares in the future.

The rising trend in private sources shown in figure 3.2 is also somewhat deceptive. Much of the increase is due to an increase in the funds provided by "miscellaneous sources," consisting primarily of taxes payable and foreign direct investment in the United States. These sources are not easily controlled by individual firms and thus the trend in nonpublic sources may not reflect conscious decisions by managers.

3.2.3 Debt versus Equity

Incremental debt and equity financing are shown in figure 3.4. The first obvious point is that there is little evidence of abnormally high reliance on debt financing during the past decade. Total debt has provided a higher-than-average fraction of total funds during the 1980s; however, the debt contributions have been no greater than they were during the long expansion and following cycle from 1961 to 1975. The debt percentage was also equally high during the first postwar cycle (although this average is due almost entirely to the 54% reliance on debt in 1946). The average debt percentages for the 1980s

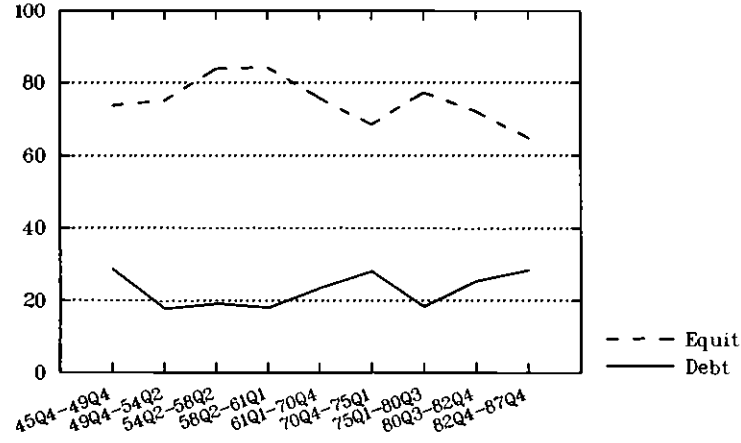


Fig. 3.4. Equity versus debt sources (% of total)

are well within one standard deviation (1 SD = 8.3 percentage points) of mean postwar debt reliance, although several of the individual years in the 1980s are more than one SD above the mean. Thus in the aggregate recent debt usage does not appear to be alarming. Nonetheless, there may be room for concern about debt usage in some industries or about the riskiness of recent debt issues.

A somewhat more pronounced trend occurs in the equity series. Equity financing has declined fairly steadily since 1958. The share of retained earnings has never again been as high as it was in 1958 (85%), although it came close in 1987 (83%; see fig. 3.3 and table 3.3). New shares have fallen precipitously since 1971. But the difference between total sources and equity sources has been made up largely from miscellaneous sources rather than standard debt sources.

A few interesting facts emerge from this review of aggregate patterns in sources of funds. First, the share of internal financing is dominant and exhibits no long-term trend: since 1975 the share has fluctuated closely around the four-decade average. Second, any strong hierarchical preference for internal funds is offset by an equally strong preference for dividends: in aggregate firms have paid out about 20% of earnings as dividends and simultaneously raised about 20% of their funds from external sources. Third, although there has been substantial movement away from net new share issues, firms still raise a substantial fraction of funds in public debt markets. The persistence in the preference for retained earnings over new shares, and the stability of the share of corporate bonds suggest that firms do care about who provides the funds, rather than selecting randomly from different sources of debt and equity.

3.3. Industry Variation in Sources of Funds

The main finding in this section is that there are significant and persistent differences in the reliance on internal funds both across industries and over time. These persistent variations support the idea that capital structure decisions involve more than the choice of a debt/equity ratio.

3.3.1 Data

The Federal Reserve does not detail its flow-of-funds accounts by industry. I constructed the data in this section from the 1988 COMPUSTAT database. It is not possible to construct a series strictly comparable to the aggregate Federal Reserve data because COMPUSTAT contains an unweighted sample of only about 6,500 firms.

I constructed industry aggregates directly from the individual firm data. The firm data were selected for use in the econometric analysis below and represent a distinct subpopulation of firms. A firm is included for a given year if long-term capitalization increased that year, that is, if retained cash plus net

sales of debt and equity is greater than zero. The restriction to firms with increased capitalization will be justified in Section 3.4 below. For now, notice that the composition of each industry aggregate may change from year to year, either because of an addition to or deletion from COMPUSTAT coverage or because some firms increase their capitalization in some years but not in others.[9] The data were collected for 1977–86.[10] The aggregates are constructed from approximately 1,400 individual firm observations each year. The data are again presented as averages over business cycles; however, both the first and last cycle are incomplete. The industry codes correspond to aggregates of 2-digit SIC codes as detailed in table 3A.1.

3.3.2 Internal Financing by Industry

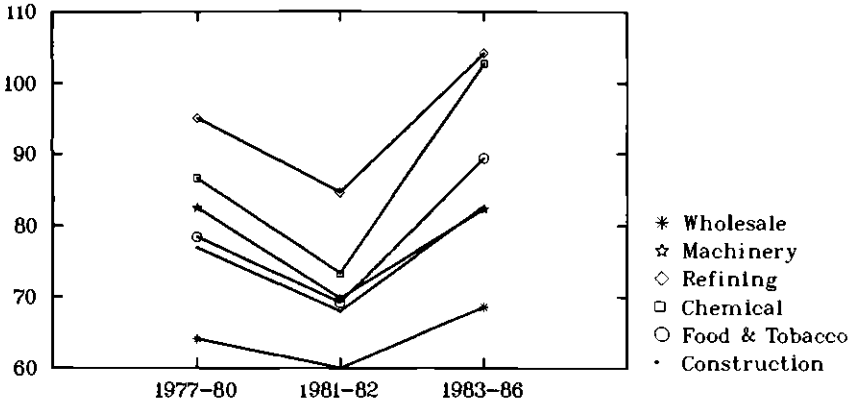
The shares for internal funds over 1971–87 are presented by industry in table 3.4. The numbers display marked variation in reliance on internal funds across industries and, in many cases, over time within a given industry.

Selected industries are graphed in figures 3.5a and 3.5b. Firms are grouped by similar patterns in the use of internal funds. Figure 3.5a presents the largest

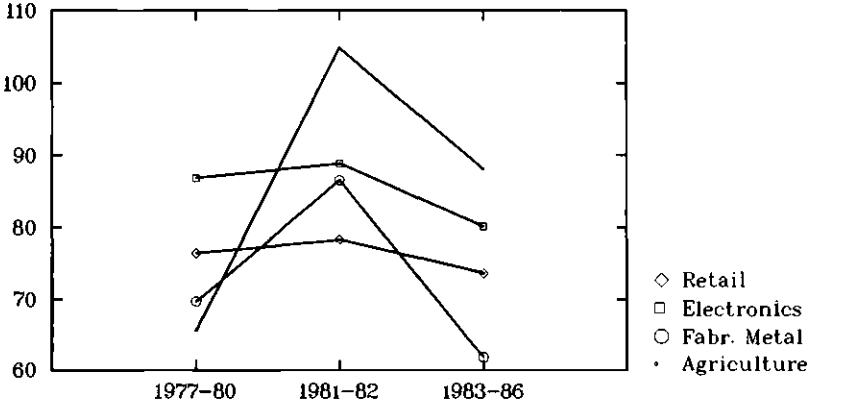
Table 3.4 **Use of Internal Funds by Industry (% of Total Sources over Business Cycles)**

Industry by SIC Code	Business Cycle			Total
	1977–80	1981–82	1983–86	
100	65.7	104.8	88.0	82.5
1000	66.8	54.8	96.5	76.3
1300	70.8	64.6	80.0	73.2
1500	76.9	68.0	82.7	77.4
2000	78.4	69.2	89.4	81.0
2200	85.0	80.9	77.7	81.3
2800	86.6	73.3	102.7	90.4
2900	95.1	84.6	104.2	96.6
3000	79.5	58.6	78.6	75.0
3400	69.7	86.5	61.8	69.9
3500	82.5	69.8	82.3	79.9
3600	86.8	88.8	80.1	84.5
3700	84.2	80.0	83.4	83.0
3800	87.2	85.1	89.6	87.8
4000	85.2	81.7	79.3	82.2
4500	79.9	52.4	69.6	70.3
4800	70.6	67.9	73.6	71.2
5000	82.1	77.0	71.1	76.7
5200	76.4	78.3	73.6	75.7
7000	64.1	57.3	68.6	64.5
Total	78.7	74.2	81.6	79.0

Note: See table 3A.1 for industry definitions. All results are from author's calculations using COMPUSTAT data.



Fig, 3.5a Use of internal funds, Group I



Fig, 3,5b Use of internal funds, Group III

group, for which reliance on internal funds dipped dramatically during 1981–82 cycle, but then rose in the most recent period (usually to even higher levels). Some other industries with this pattern were not graphed for visual clarity. The firms in Group I account for about 74% of the net assets in the sample. The four Group III industries in figure 3.5b (15% of net assets) relied more heavily on internal funds during 1981–82, but (except for Agriculture) ended the period at a lower level than they began. The intermediate group of industries are not graphed (Wholesale Trade, 5000; Textile Mills, Lumber, Furniture, Paper and Printing, 2200; and Ground, Water and Miscellaneous Transport, 4000) due to space limitations. These displayed a slight downward trend in internal funds and almost no change in either debt or equity shares (examined below).

Industries differ in the long run as well as from period to period. At the

extremes, the Hotel, Entertainment, and Service aggregate (7000) obtained only 65% of its financing from retentions on average, while Petroleum Refining (2900) provided 96.6% of its funds internally. These two industry groups exhibited the same time-series pattern of internal financing (fig. 3.5a), but are very different in the extent to which they turn to outsiders for new funds.

The variations suggest that the use of internal funds cannot be entirely explained by business cycle effects, secular trends in the economy, or widespread changes in financial practices. Of course the distribution of financing patterns might be due to pure chance rather than to different firm preferences and opportunities. I shall look for systematic determinants of financing decisions in Section 3.5.

Variations in the share of internal financing are offset by changes in external shares. I shall now examine how the shifts in external sources were distributed across debt and equity for different industries.

3.3.3 Debt Financing by Industry

Reliance on debt exhibits substantial variation, as did internal financing. However, firms that followed similar patterns in the use of internal funds do

Table 3.5 **Use of Debt by Industry (% of Total Sources over Business Cycles)**

Industry by SIC Code	Business Cycle			Total
	1977–80	1981–82	1983–86	
100	31.2	−15.6	57.1	32.2
1000	23.1	37.4	5.4	18.9
1300	21.3	34.0	20.7	23.6
1500	22.3	12.1	13.3	16.6
2000	16.3	24.8	22.4	20.5
2200	13.0	14.5	22.6	17.1
2800	10.4	11.4	7.7	9.6
2900	4.3	14.7	30.1	16.7
3000	16.4	35.6	16.9	20.5
3400	21.6	8.9	30.6	22.7
3500	11.8	24.0	5.1	11.6
3600	5.5	2.5	14.3	8.4
3700	10.3	16.0	14.6	13.1
3800	8.1	9.4	12.0	9.9
4000	12.9	17.0	16.7	15.3
4500	12.0	38.2	18.9	20.0
4800	18.4	16.2	16.7	17.3
5000	15.8	18.6	17.6	17.1
5200	21.5	14.1	20.1	19.5
7000	29.5	23.5	28.8	28.0
Total	16.3	17.9	19.6	17.9

Note: See note to table 3.4.

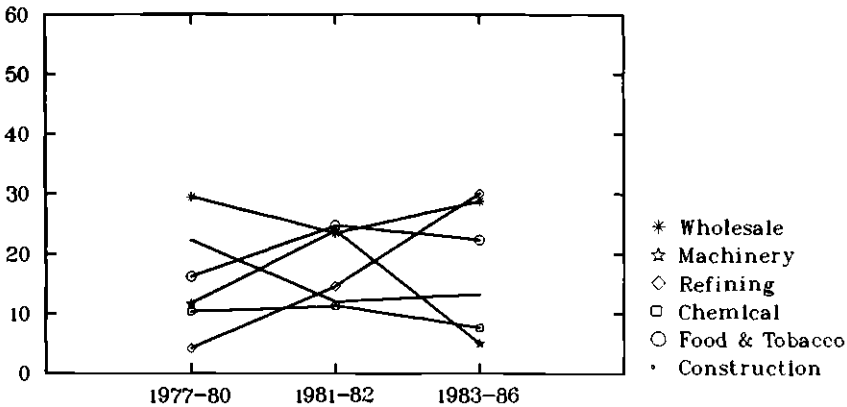


Fig. 3.6a Use of debt, Group I

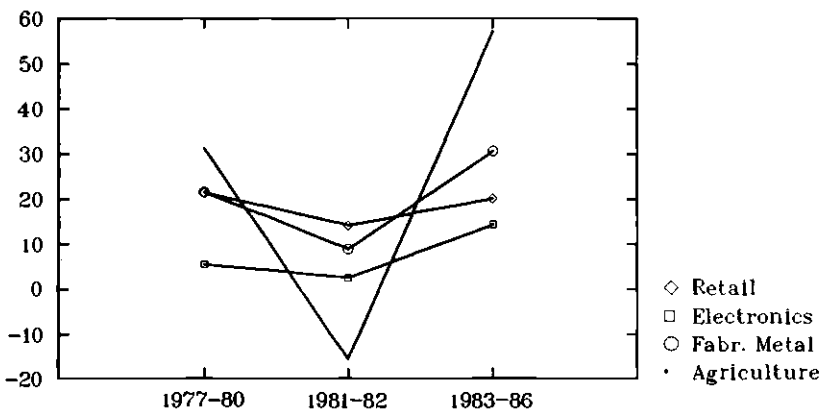


Fig. 3.6b Use of debt, Group III

not look similar in their use of debt. The business cycle averages as a percentage of total sources are given in table 3.5. Figures 3.6a and 3.6b graph the industries using the same groupings as before.

I noted in Section 3.2 above that debt usage has increased during the last 10 years, but not dramatically. For this sample, incremental reliance on debt rose from 16% during the first period to 20% during the last period (table 3.5). But while some industries increased their debt use substantially, quite a few decreased.

Figure 3.6a displays a jumbled pattern for the Group I firms. Petroleum Refining (2900) added huge amounts of new debt, going from an average 4% debt share in 1977–80 to a 30% share during 1983–86. Machinery firms (3500) went from 12% to 24% to 5% debt usage. Metal Mining (1000) dropped from 23% to 5% (see table 3.5). In addition to the time-series varia-

tion, the cross-sectional spread in debt usage is large: from about 5% to 30% debt shares both at the beginning and end of the period.

Two other industries greatly increased debt usage: Textile, Lumber, Furniture, Paper and Printing (2200) went from 13% to 23%; and Agriculture (100) went from 31% to 57%, (but with net debt *retirements* of 16% in the middle period). Other industries maintained relatively steady or slightly increased rates of debt usage.

The data reported here contradict Lintner's contention that "there are clear and remarkably persistent patterns in the relative use of debt financing by firms in different industries" (1985, p. 79). At least over the past decade, the use of debt within industries has fluctuated significantly. It may be that the relatively high level of aggregation is masking persistent patterns for more disaggregated industries, and that the changing relative importance of more narrowly defined industries leads to the variation in my aggregate figures. So much variation in the composition of industries over 10 years seems unlikely, however.

3.3.4 New Share Issues

Net new share issues have sharply decreased in recent years and, in fact, have become substantially negative due to repurchases. Shoven (1986) has estimated that cash payments to equity holders through repurchases and cash-financed mergers and acquisitions have been much larger than divided payments during recent years. We shall see that the intensity of equity absorption has been far from uniform across industries.

Table 3.6 presents net share issues by industry. The industries are graphed by group in figures 3.7a and 3.7b. Recall that firms in Group I industries reduced their reliance on internal funds during the middle period, but then moved to higher levels of internal financing during the most recent years (fig. 3.5a). There was no consistent pattern in their debt policies (fig. 3.6a). We can see from figure 3.7a that this group was for the most part alternating between internal and external equity. During the initial stock market rise in 1981–82, many firms brought out new issues; Group I shows constant or increased rates of net new shares during this period.[11] For most of these industries net share issues fell dramatically after 1982 and were negative for several years. From figure 3.7a we can see that most of these industries also were decreasing their use of external debt during the last few years.

The Group III industries are those that increased the share of internal funds in 1981–82, then decreased more recently. Two (Fabricated Metal and Electronics) offset shifts in internal financing with changes in the share of external debt rather than equity; Agriculture (100) decreased and Retail Trade (5200) substantially increased their reliance on new equity (fig. 3.7b). The large negative share for Agriculture is due to major repurchases in 1984 and 1985 by U.S. Sugar, DeKalb, and Castle & Cooke.

Table 3.6 **Use of New Shares by Industry (% of Total Sources over Business Cycles)**

Industry by SIC Code	Business Cycle			Total
	1977–80	1981–82	1983–86	
100	3.1	10.7	−45.1	−14.7
1000	10.1	7.8	−1.8	4.9
1300	7.9	1.4	−0.8	3.1
1500	0.8	20.0	4.0	5.9
2000	5.3	6.0	−11.8	−1.4
2200	2.0	4.6	−0.3	1.6
2800	3.0	15.2	−10.4	0.1
2900	0.7	0.7	−34.3	−13.3
3000	4.1	5.8	4.4	4.6
3400	8.7	4.6	7.6	7.4
3500	5.7	6.3	12.6	8.6
3600	7.7	8.7	5.6	7.1
3700	5.5	4.1	2.1	3.9
3800	4.7	5.6	−1.7	2.3
4000	1.9	1.3	4.0	2.6
4500	8.1	9.5	11.5	9.7
4800	11.1	15.9	9.7	11.5
5000	2.1	4.3	11.4	6.3
5200	2.1	7.6	6.3	4.9
7000	6.4	19.2	2.6	7.4
Total	5.1	8.0	−1.2	3.1

Note: See note to table 3.4.

There is quite substantial cross-sectional variation in the degree of reliance on new shares in the total sample, even with the high level of aggregation. Many industries cluster around 5% net new shares, but several industries use external equity for as much as 15% to 20% of their funds during the 1981–82 period. The range during the last cycle is from −45% to 13%.

It is also important to note that, although in aggregate corporations were absorbing large amounts of equity during the last several years, quite a few industries were using increasing and positive amounts of net new equity: Machinery (3500), Airlines (4500), Fabricated Metal (3400), Ground and Water Transport (4000), and Wholesale Trade (5000). The movement toward nondividend cash distributions was far from universal.

3.3.5 Conclusion

In Section 3.2 I demonstrated that the fraction of nonfinancial corporate funds provided by internal cash has fluctuated somewhat, but the average over business cycles remains fairly stable, around 70%. This contrasts with earlier observations by Friedman (1980) and Taggart (1985), who saw a postwar trend away from internal funds toward debt. By extending the time series past

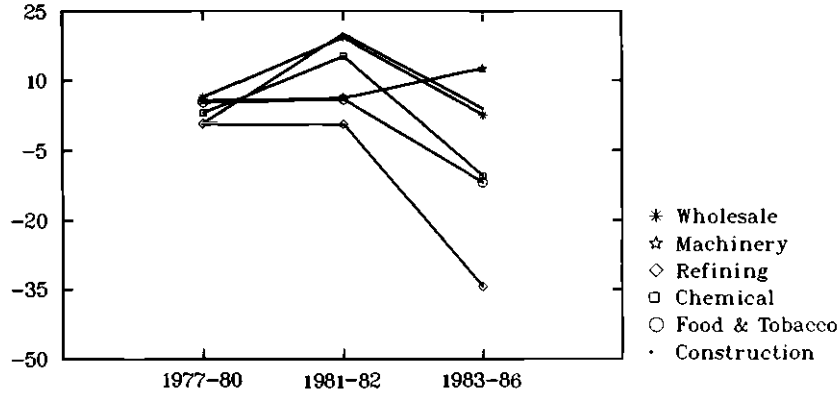


Fig. 3.7a Use of new shares, Group I

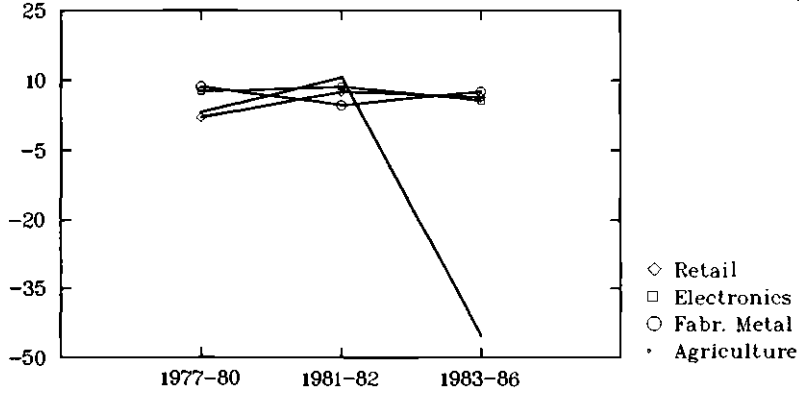


Fig. 3.7b Use of new shares, Group III

1979 there appears to be no trend away from internal funds, and the movement toward debt (away from external equity) is not outside the normal long-run variation.

The stability of aggregate reliance on internal funds does not carry over to industry patterns of financing. Even at high levels of industry aggregation there is quite substantial variation in both the time-series and cross-sectional patterns of internal financing. The variation is even greater if examined year-to-year rather than as a series of business cycle averages. Many industries shifted significant shares of financing from internal cash to external equity during 1981–82; then they again increased the share of internal funds in more recent years while dramatically decreasing net new share issues, as well as decreasing reliance on debt in some cases. However, several industries exhib-

ited precisely the opposite pattern, and a number of others can not be categorized in either way.[12]

There are large and persistent differences in the degree to which different industries rely on internal funds. There are also significant variations in the pattern of internal financing over time. When the reliance on internal funds changes, the compensating sources of external finance—debt or equity—also vary over time and across industries. We clearly cannot explain the use of internal funds simply with aggregate trends in the economy or in financial institutions and practices. Different firms rely to varying degrees on internal funds. In the next two sections I present an econometric analysis of individual firm financing decisions.

3.4 Determinants of Financial Choices

The data presented in the first two sections showed substantial variations in the use of internal funds that are not explained by business cycle fluctuations. The data also reveal large differences in the use of internal funds across industries. It thus appears that there are nontrivial distinctions between the providers of funds, as well as differences between types (debt and equity).

Are these variations purely random, or are they due to the effects of economic forces on firm financing decisions? As a first step in answering this question, I estimate a simple econometric model of individual firm decisions. Unlike many prior researchers, I distinguish between who provides the funds as well as the type of funds. I find several factors that help to explain firm reliance on various sources.

Some important prior research has indicated that it matters who provides financing. For example, Chris James (1987) examined stock price reactions to announcements of different types of debt financing and found that the market reaction varies with the identity of the provider (*e.g.*, bank, private placement, public bond). In a more direct study of financing preferences, McDonald and Soderstrom (1988) estimate multinomial choice models for dividend and share repurchase decisions. Their approach is quite similar to the analysis in this paper. Their evidence suggests that a financing hierarchy exists and that the marginal source of funds for a firm changes over time.

Although there has been only a little empirical research on this financing question, several studies of investment have allowed for possible effects from distinctions between providers of funds. If there are significant asymmetric information costs for different sources, then the Modigliani and Miller (1958) irrelevance result fails to hold and financing should affect investment. Fazzari, Hubbard, and Petersen (1988) find that investment by those firms most likely to face external credit constraints is significantly determined by cash flow. Blundell et al. (1988) and Devereux and Schiantarelli (ch. 11, in this volume) obtain similar results in two studies of investment by U.K. firms. Whited

(1988) finds that implicit constraints on debt issuance affect investment in a panel of firms. Hoshi, Kashyap, and Scharfstein (1988; ch. 4, in this volume) study investment by Japanese firms and conclude that access to bank finance within a "trading group" increases investment relative to firms unaligned with a bank.

The approach I take to financing distinctions is to study incremental decisions. In the remainder of this section I describe the choice model, the data, and the hypothesized determinants of choice among sources of funds. The results are presented in Section 3.5.

3.4.1 Choice among Financing Alternatives

Consider a firm that wishes to raise new financial capital. I presume that the managers seek to maximize firm value. Funds can be obtained from several sources, each potentially having different effects on firm value. Choices are distinguished by the type of contingent financial claim (debt or equity) and by the provider of funds (private or publicly marketed sources). Thus, I model the alternatives as a multidimensional choice set, with one dimension as M = {public,private} and the other choice dimension as S = {debt,equity}. A financing choice is given by $c_{ms} \in M \times S$, a combination from the two choice dimensions. For example, corporate bonds are denoted by $c_{\text{public,debt}}$.

Each source of funds can affect firm value. Let the increment (positive or negative) to the firm's objective function from a particular source be decomposed as

$$V_{ms} = U_m + U_s + U_{ms} + \tilde{\varepsilon}_m + \tilde{\varepsilon}_s + \tilde{\varepsilon}_{ms}.$$

The U terms represent the deterministic effects on firm value peculiar to each financing dimension separately (market, security type), and the effects peculiar to the particular combination (U_{ms}). The $\tilde{\varepsilon}$ terms decompose the random effects on value in the same way. That is, the effect specific to a security being publicly marketed (regardless of whether it is debt or equity) is given by $U_{\text{public}} + \tilde{\varepsilon}_{\text{public}}$, and likewise for the security dimension. Any interactive effects peculiar to a particular source raised in a particular market setting are captured in $U_{ms} + \tilde{\varepsilon}_{ms}$. This decomposition allows for similarities between sources that share a dimension, but still permits for effects specific to each source.

If we assume that either $\text{var}(\tilde{\varepsilon}_s) = 0$ or $\text{var}(\tilde{\varepsilon}_m) = 0$, and make appropriate assumptions about the distribution of the remaining stochastic terms, then the choice model is known as a nested logit model (McFadden 1981).[13] The restriction that one of the choice dimensions not have its own stochastic component (*i.e.*, the zero-variance condition) limits the description of the possible effects of financing sources on firm value.[14] I estimated both choice models, with the two different variance restrictions. The two models are illustrated in figure 3.8, as choice tree 1 and choice tree 2. The first model, tree 1, has the interpretation that firms choose whether to use public or private sources, and then from one of those branches choose either debt or equity. The second

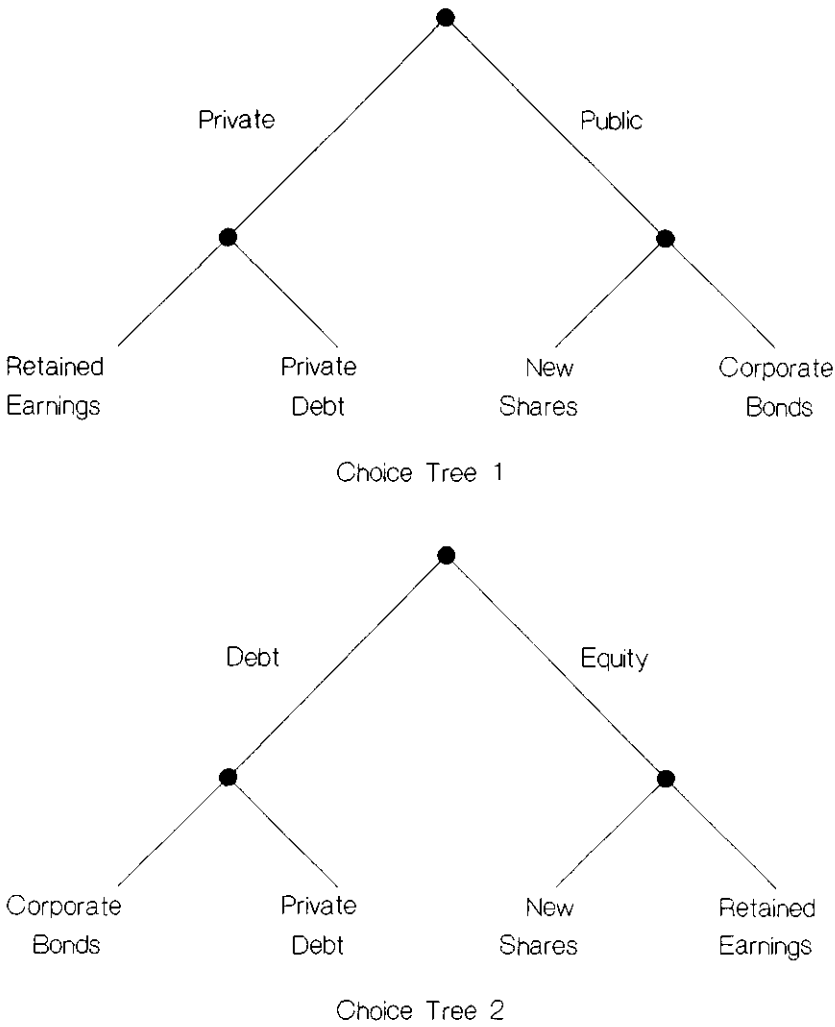


Fig. 3.8. Financial decision trees

model has the firm choosing debt or equity first, then deciding from what provider to obtain the funds.

To estimate the determinants of choice, I specify U_m, U_s, and U_{ms} as linear functions of hypothesized explanatory variables, X; for example, $U_s = X\beta_s$. The probability that a firm chooses a particular source from the multidimensional choice set can be written as

$$\text{pr}(m,s) = \text{pr}(s|m)\ \text{pr}(m),$$

and with the nested logit stochastic specifications we have

$$\text{pr}(s|m) = \frac{e^{(U_{ms} + U_s)}}{\sum_{s' \in S} e^{(U_{ms'} + U_{s'})}},$$

$$\text{pr}(m) = \frac{e^{(U_m + \tilde{I}_m)\alpha}}{\sum_{m' \in M} e^{(U_{m'} + \tilde{I}_{m'})\alpha}},$$

where $\tilde{I}_m = \ln[\sum_{s' \in S} \exp(U_{ms'} + U_{s'})]$, the log of the denominator of $\text{pr}(s|m)$, and α, a parameter to be estimated. Here $\tilde{I}_m$ is known as the inclusive value. Given the probabilities of observing particular choices, the model can be estimated using either maximum likelihood or a nonlinear sequential estimator (McFadden 1981).[15]

3.4.2 The Observed Choices

Two data problems complicate estimating the determinants of financing decisions using a discrete-choice model. First, although firms may be making decisions incrementally and discretely, the sampling frame of the data is more coarsely grained. In MacKie-Mason (1990) only public issues were studied. Since public securities must be registered, SEC data tapes precisely identify each incremental issuing decision. To study financing decisions that include private debt and retained earnings, we must rely on annual accounting statements. Thus the financing decisions must be treated as if the firm chooses its sources of funds once per year. In most cases this means that a single observation actually represents several financing decisions.

Another problem is that firms may raise funds from more than one source at a time. In only a tiny fraction of instances do firms register more than one public security at a time, and in only a few more cases do firms separately register different types of securities within a short time frame. However, in data that combine private and public sources and that are aggregated over a year, the problem will be much more common. In fact, most firms in the COMPUSTAT universe use at least retained earnings and private debt and often one or two of the public sources of funds in a given year.

I have taken the following approach to defining financing choices. My *a priori* logic was suggested by the possibility of a financing hierarchy of the sort proposed by Myers (1984): firms prefer to use internal funds, then private debt, then, only if necessary, publicly marketed securities. This is consistent with the frequencies of public issues in the sample: of the 14,398 observations on firms that increased their capitalization in a given year over 1977–86, only 1,463 were public security issues. Thus, I chose to code the choice variable as "new shares" if the firm issued stock, regardless of other sources of funds; "bonds" if the firm sold corporate bonds; "private debt" if the net increase in debt sources exceeded the net increase in equity sources (but the firm did not issue bonds); and "retained earnings" in all other cases. If the firm did not publicly issue, it is classified as private debt or equity depending on which source contributed the most funds that year. If the firm did publicly issue, it is coded as public debt or equity regardless of issue size.

The sample is drawn from the COMPUSTAT universe. A nonfinancial corporation was included for a particular year if its long-term capitalization (net changes in equity plus net changes in debt) increased that year, according to the Statement of Changes in Financial Position. Most of the tax, moral-hazard, and hidden-information theories that predict financing choices imply that the Modigliani-Miller irrelevance proposition does not hold. That means that the financing choice may depend on the intended use of funds. There is no practical way to measure the nature of the incremental investment decisions made by the firms each year. In order to control for the some of the simultaneity between investment and financing I restrict analysis to firms that increased their total capitalization, thus holding constant the direction of change in the firm's capital stock.

Firms were retained only if complete data were available for the dependent and explanatory variables.[16] Firms that issued publicly were identified by matching the COMPUSTAT sample to the Security and Exchange Commission's Registered Offering Statistics tape, which has records for every registered public offering since 1977.[17] The sample runs from 1977–86. The full sample has 14,398 observations, of which 832 are public stock issues, 631 are public debt issues, 1,720 are coded as private debt, and the remaining 11,215 are coded as private equity (retained earnings).

3.4.3 Explanatory Variables

The explanatory variables were selected from COMPUSTAT as those measures *a priori* expected to best capture the hypotheses discussed in Section 3.1. Most of these variables have found support as financing determinants in other empirical papers. I did not want to contaminate the statistical inference process by pretesting and selecting among possible factors, so all variables were retained in the analysis even if they have insignificant or puzzling coefficients.

To avoid simultaneity, all explanatory variables are measured for the year prior to the financing decision. The variables are described below. Detailed definitions can be found in the appendix to MacKie-Mason (1990). All of the accounting variables that measure levels have been divided by net sales to control for scale effects.

Flotation Costs

We saw in Section 3.2 that retained earnings are the dominant source of funds, followed by private and public debt, with public share issues the smallest source. It is possible that this pattern of financing is due to transactions costs. Issue costs are lowest for retained earnings, low for private debt, higher for public debt, and highest for new shares, with substantial underwriting and registration fees and costs for public issues of both debt and equity.

Borun and Malley (1986) found that underwriting and registration expenses averaged 4.1% of the issue value for new public utility stock. A much older

study by the Securities and Exchange Commission (1957) considered costs for different issue sizes; the smallest issues had average flotation costs over 20%, falling to 5.4% for large issues. Flotation costs for debt are generally much lower than for new shares. Blackwell and Kidwell (1988) report average costs of 0.8% for private debt placements and 1.2% for public placements. The SEC study also found that debt issue costs decrease with issue size.

There is no reason, however, to think that flotation costs explain the variation in sources of funds across time, industries, and firms. The analysis below is intended to identify determinants that distinguish between the financing choices made by particular firms. The question asked is whether, *ceteris paribus* (including flotation costs), there are any economic conditions that influence firms' choices over sources of funds.[18]

Hidden-Information Indicators

The hidden-information theories predict that firms will prefer certain types of providers, regardless of the type of security. Since I must rely on publicly available data I cannot hope to measure the extent or nature of any informational advantages possessed by firms at particular times. This may not be a serious problem, however: the investors who decide how large a lemons premium to require do not also possess the firm's private information. What investors can do is use public information to forecast the magnitude and severity of informational asymmetries. I selected several variables as possible indicators of the likely severity of hidden information.

The models of Bhattacharya (1979), John and Williams (1985), and Miller and Rock (1985) suggest that dividend payments function as a signal when managers have private information. If dividends are an effective signal of firm prospects, then investors in non-dividend-paying firms are likely to have less information about what the managers know, all else equal. We should expect non-dividend-paying firms to avoid public market financing. On the other hand, the double taxation of dividends gives firms an incentive to reduce dividends and use retained earnings as a source of equity finance, rather than issue new shares (Auerbach 1983, 1985). Thus we might expect a dividend-paying firm to reduce dividends and finance using internal funds (or to use debt rather than new shares). However, it is well known that firms are very reluctant to cut dividends, suggesting that the signaling value of dividends outweighs the tax savings from financing out of dividends.[19]

A second indicator of potential hidden-information costs is the forecast variance of firm earnings. It has been well established in the accounting literature that earnings follow a random walk (Healy and Palepu 1986; Watts and Zimmerman 1986, chap. 6). Thus, the standard deviation of the first-difference in accounting earnings is proportional to the forecast variance of earnings. If this variance, which I call VEARNA, is large, then investors have relatively little ability to forecast future earnings based on public information. In such a case

I expect that there is a high likelihood that managers have advantageous hidden information and that the correspondingly large lemons premium required by public investors will discourage publicly marketed financing.

Another indicator is a change in the firm's stock price. A number of studies have found that firms tend to issue more new shares when their stock price is high (Taggart 1977; Marsh 1982; MacKie-Mason 1990). If firms were aiming for target debt/equity ratios, then a rise in stock prices should instead lead to more debt usage to restore the ratio. One plausible explanation for market timing has been suggested by Bagnoli and Khanna (1987). They incorporate both real costs of leverage and the Myers and Majluf (1984) hidden-information problem in a financing model. A rising market indicates that investors have become convinced of a favorable improvement in the firm's prospects, and thus are more likely to believe that the firm seeks financing for good projects rather than bad. That is, the market seems to have recently decided that this firm's investments are *not* lemons. To measure a market-timing effect I include the change in the firm's stock price over the previous year.

As another explanatory factor I include a dummy variable for industries that were subjected to economic rate regulation during much of the sample period: namely, trucking, trains, airlines, and telephones. Regulators are hypothesized to play the role of an information collector and validator for public investors, thus ensuring that any substantially bad news is made public. Further, regulation might serve to dampen the effects of good and bad surprises by attempting to stabilize economic returns.[20]

Tax-loss carryforwards may indicate the possibility that any hidden information could be very costly to investors. To see this it is necessary to know something about loss carryforwards. First, a firm is allowed to carry any tax losses back against three previous years of income to obtain an immediate refund. If the loss is carried forward, it is credited against future income without any accumulation of interest. Thus firms almost always carry losses back in order to obtain an immediate tax savings rather than the discounted value of future savings. If a firm has carryforwards it has usually been a poor performer for several years. Further, Auerbach and Poterba (1986) have shown that firms with tax losses tend to persist in that state, further indicating a poor performer. Once a firm is identified by investors as a poor performer, any hidden information that managers might have is likely to have a relatively large impact on the value of new security issues, and thus the required lemons premium will be higher.

A final factor that I expect to influence the firm's preferences over types of providers is the firm's R&D intensity. When a firm is doing a lot of R&D we might expect many instances of managers having important private information about changes in the firm's prospects. Thus, high R&D firms should avoid external financing. The predicted effects of these explanatory variables are summarized in table 3.7.

Table 3.7 **Predicted Effects of Explanatory Variables**

Potential Determinants	Effect on Private	Effect on Debt
Paying dividends	−	0
Forecast variance (VEARNA)	+	0
Tax-loss carryforwards	+	−
Stock price change	−	0
Regulated	−	0
R&D	+	−
Advertising	0	−
Fraction plant	0	+
Net assets	0	+
Earnings volatility (VEARNB)	0	−
Investment tax credits (ITC)	0	+
ITC/ZPROB	0	−
1/ZPROB	0	−
Debt/assets − average	0	−
Debt/assets	0	+
Cash deficit	0	−

Note: Signs indicate predicted effect on probability of choosing private relative to public sources (col. 1) or debt relative to equity. Zeros indicate no predicted effect.

Optimal Leverage Determinants

As discussed in Section 3.1, the predicted determinants of a firm's optimal leverage ratio are the benefits and costs associated with different contingent claims on cash flow. Three effects have received the most attention: (1) the tax costs from interest deductions crowding out other tax shields; (2) the real wealth costs of bankruptcy (made more likely by higher debt levels); and (3) the costs of inefficient investment decisions resulting from the senior fixed claims of outstanding debt on incremental investment returns. I shall describe several variables used to capture these effects, in reverse order.

Outstanding debt claims create a wedge between the returns to new investment and the firm's shareholders. The more that a firm's value depends on future investment opportunities, rather than on already committed investments, the more costly a debt issue is likely to be. Thus, firms with relatively low implicit collateral in the form of tangible assets are expected to use less debt.

I use several measures of debt capacity. The fraction of plant and equipment in total assets is intended to measure the availability of tangible collateral. Since I am looking at incremental financing (rather than the firm's choice of total debt level), I also expect the firm's size as measured by net assets to matter, since a single new debt issue might be more easily absorbed by a large firm. Bradley, Jarrell and Kim (1984) and Long and Malitz (1985) have suggested that a firm's advertising expenditures and research and development are indicators of intangible assets and thus predict less reliance on debt.[21]

The second type of optimal leverage determinants are the real costs of financial distress. If periods of financial distress or bankruptcy impose costs on shareholder wealth, then new debt—by increasing the likelihood of distress—bears an expected distress cost relative to equity financing. I expect that the increase in bankruptcy likelihood from a new debt issue is larger for a firm already facing a substantial probability of distress than for a healthy firm.[22]

I introduce two variables that measure the likelihood of a firm becoming financially distressed. The first is *1/ZPROB*, which is Altman's (1968) predictor for classifying firms likely to enter bankruptcy.[23] This *ZPROB* is a weighted average of several balance sheet ratios. The greater is *1/ZPROB*, the greater is the expectation that the firm will enter a state of financial distress. In addition, I have constructed a second variance measure of the firm's operating risk: *VEARNB*. This measure is the standard deviation of percentage changes in earnings. Recall that *VEARNA* was described above as an indicator of high forecast variance, and thus of potential hidden-information costs. In *VEARNB* changes are weighted more heavily in years following low earnings (the denominator in the percentage change is close to zero), which should make it a better indicator of bankruptcy likelihood than *VEARNA*. However, both measures are imperfect and we should be cautious in interpreting them as measuring different effects.

The third leverage cost is tax shield crowding out. The higher are a firm's nondebt tax shields, the higher is the expected after-tax interest rate it must pay since there is a greater chance that the firm will be in a zero-tax status. Thus the firm's supply curve of bonds will slope upward.[24] Thus a firm with high nondebt tax shields will prefer to use less debt and more internal funds (retained earnings) or new share issues. However, a firm likely to be tax exhausted is not likely to have high retained earnings for investment. Thus a tax shield effect should primarily distinguish between debt and new shares. Two tax shields I measure are the firm's tax-loss carryforwards (which can offset future tax liabilities) and investment tax credits.[25] Advertising and R&D play the role of tax shields, since they can be thought of as investments that are immediately expensed for tax purposes.

Most studies of debt ratios have failed to find tax shield effects, or have obtained the wrong sign.[26] MacKie-Mason (1990) hypothesized that the investment tax credit (ITC) tax shield might be confounded with ITC acting as a proxy for new physical assets. The moral-hazard theories discussed above predict that firms with physical assets have implicit collateral and are more likely to issue debt. These contradictory effects were successfully distinguished by entering ITC alone, and also interacted with a measure of financial distress. The tax shield effect is more important for firms closer to financial distress since the firm is more likely to be tax exhausted.[27]

Other Variables

I have also included cash flow and past leverage ratio variables in the analysis. A firm with low cash flow is more likely to need external sources of funds. I am using lagged variables to avoid simultaneity, so cash flow will be a good determinant of constraints only if it is a good predictor of the next year's flows. Following Auerbach (1985), I construct a cash deficit variable that is the difference between cash flow and "committed" expenditures (long-run average dividends and the cash necessary to pay for capital expenditures while maintaining the firm's long-run debt-to-assets ratio).

A conflicting prediction on the effect of cash flows is provided by Jensen (1986). If it is costly to monitor managers to ensure that they do not waste uncommitted cash on perquisites and self-interested investments and expenditures, then value might be increased if firms with large free cash flows issue debt in order to increase future cash commitments. Thus, it is not clear if we should see firms with cash surpluses financing internally or externally. When we look at the choice between debt and new shares, however, Jensen's theory predicts a preference for debt to absorb cash flows.

One important reason to study the firm's incremental sources of funds is to avoid the assumption present in most capital structure research that firms have optimal debt ratio targets.[28] Of course, if firms *do* have debt ratio targets, then the effects of the other explanatory variables are conditional on whether the firm is above or below its target debt ratio. I include the lagged debt-to-assets ratio, and the difference between the lagged debt ratio and the long-run (10-year) average debt ratio. If the firm has a stable target ratio, then the latter measure should indicate, on average, which side of the hill needs to be climbed. However, a firm that prefers a high debt ratio will have a high lagged ratio, *ceteris paribus*, and will be more likely to rely heavily on debt for new funding.

Summary

The expected effects of the explanatory variables on debt/equity and private/public choices are summarized in table 3.7. At least to the first order most of the variables are expected to be relevant for one choice dimension but not the other. There are exceptions, such as R&D and *VEARNA*. But there are enough distinctions that it should be possible to obtain clear evidence on whether firms care about the provider of funds separately from the type of financing.

3.5 Econometric Results

The estimation results are presented in tables 3.8 and 3.9 below. The focus of this paper is on the distinction between types of providers (private *vs.* public) so I have presented the top branch (private/public choice) shown in choice

tree 1 (see fig. 3.8) in table 3.8, and the two lower branch private/public choices from choice tree 2 in table 3.9. I also include the public debt/equity branch from choice tree 1 in table 3.8 to indicate the ability of the hypothesized debt/equity determinants to explain some debt/equity choices. The other branches of the two models are not directly relevant to the topic of the paper and thus are omitted for clarity of presentation.[29] For private/public choices a positive coefficient indicates a greater probability of private financing; for the public debt/equity branch a positive coefficient indicates a greater probability of debt.

3.5.1 Private or Public Sources?

I first consider the results from dividing the entire sample into private or public, shown in the second pair of columns in table 3.8. Most of the indica-

Table 3.8 **Nested Logit Analysis of Financing Choices (Choice Tree 1)**

	Public Debt/Equity (Debt = 1, Equity = 0)		Private vs. Public (Private = 1, Public = 0)	
Variable	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Constant	−.961	−1.39	5.58	19.5
Paying dividends	.472	1.75	−.672	−7.13
VEARNA	−5.74	−2.51	1.45	1.89
Tax-loss carryforward	−3.04	−1.71	.760	3.41
Price change	−1.13	−6.40	−.358	−7.74
Regulated	−1.04	−1.69	−.639	−2.39
R&D	−4.41	−.988	−8.62	−6.68
Advertising	6.54	2.27	−3.36	−2.96
Fraction plant	.0625	.153	−.508	−2.99
Net assets	.0124	.905	−.101	−5.36
VEARNB	−.0974	−2.03	−.00174	−.887
ITC	54.2	1.85	−5.54	−1.02
ITC/ZPROB	−69.7	−1.92	−1.70	−.410
1/ZPROB	1.45	2.74	.0810	1.47
Debt/assets − average	−1.10	−1.36	2.19	6.47
Debt/assets	−.964	−1.32	−4.44	−16.7
Cash deficit	−2.49	−1.66	.0696	.227
Inclusive	. . .	. . .	.0626	1.53
Observations	1463		14398	
Mean of dependent variable	.431		.898	
Log likelihood	−720.9		−4165.0	
Lerman's R^2	.289		.583	
Lerman's $\bar{R}^2$	.249		.578	
McFadden's R^2	.279		.120	

Note: The lower branch choice between private debt and equity is not reported for clarity. These results are available from the author. Each branch was estimated with 10-year dummies and 15 industry dummies. The *t*-statistics are asymptotic.

tors of hidden-information problems have the predicted sign. Firms that were not paying dividends, have volatile earnings (high *VEARNA*) or tax-loss carryforwards, experienced a stock price decline, or were not publicly regulated were more likely to use private sources of funds.

Firms are reluctant to cut dividends, thus paying dividends is a signal that the firm expects to have reliable cash flows. Firms that are unable to signal or choose not to signal expected cash flows through dividends will be subject to a higher "lemons" premium on their public securities and thus prefer to avoid public issues. The same effect is indicated by the positive sign on *VEARNA*: if a firm has volatile earnings, outsiders are more uncertain about future prospects and are less willing to buy public security issues, so such firms prefer to finance privately. On the other hand, hidden-information problems are likely to be less severe for publicly regulated firms (trucks, trains, planes, and telephones) because of public disclosure and some degree of control over rates of return.[30]

Tax-loss carryforwards suggest poor performance by the firm. Loss carryforwards do not appear to be a tax shield effect here, since neither ITC variable is significant. What a loss carryforward does indicate is persistent performance problems since the firm has the opportunity to carry losses back against three previous years of income to get an immediate refund. Further, tax loss firms on average tend to continue as poor performers (Auerbach and Poterba 1986). Such firms are reluctant to seek public financing because they will be subject to high lemons premia.

Firms are much more likely to raise money in public markets if their stock price has risen. A price rise indicates that investors have become convinced that the firm's projects are good ones. Thus the market is more likely to view a new issue as financing needed for good investments rather than bad. Since the firm has been sorted into a "good" category, it will have to pay a smaller lemons premium.

The negative coefficient on R&D is surprising since substantial research was expected to indicate potential hidden information problems. However, the effect of advertising may be consistent with the hidden information story: firms that do lots of advertising tend to be in mature, less innovative industries such as food products or retail. If such firms provide fewer opportunities for unfavorable surprises to investors, then they may be able to obtain public funds without substantial hidden information premiums. Likewise, the net assets and fraction plant coefficients may be indicators of mature, more transparent firms. Large firms are followed much more closely by investment researchers and analysts, so hidden-information costs should be lower.

Most of the variables predicted to affect the choice of *security type* rather than provider type have statistically insignificant coefficients in the private/public choice branch. The likelihood of financial distress as measured by *VEARNB* AND *1/ZPROB* has small and insignificant effects. The cash flow

variable predicted by Jensen's free cash flow hypothesis is near zero and insignificant. The ITC tax shield has no effect. The exceptions are the debt/asset ratios for which I have no explanation. Thus, the predicted distinctions between preferences over type of funds and type of provider appear to be strongly supported.

One possible problem with the model underlying choice tree 1 is that the private funds category combines two very different types of funds—private debt and retained earnings—that are also obtained from rather different types of providers. Although neither source is publicly marketed, which distinguishes them from the other two sources, retained earnings are obtained internally by management decision, while private debt needs the cooperation of external lenders. Choice tree 2 provides a different view (fig. 3.8 and table 3.9). On the lower branches I control for funding type (debt or equity), and examine the private/public choice just between funds of the same type. That is, given equity, when does the firm prefer private (retained earnings) to a new issue, and similarly for debt?

The results presented in table 3.9 corroborate the discussion above, indicating the robustness of the hypotheses. Of all the variables predicted to be the primary determinants of the private/public choice, only *VEARNA* in the equity branch reverses sign, and it is statistically insignificant. For equity, paying dividends, not having tax losses, a stock price rise, and being regulated continue to predict a greater probability of publicly marketed financing. For debt, paying dividends and low earnings forecast variance are still significant; the other effects have the predicted sign but are statistically insignificant (notice, however, that the sample size is much smaller for the debt branch). Also significant for debt are net assets, advertising, and fraction plant, all of which have plausible hidden-information interpretations given above, although the predictions were not as clear *ex ante*.

Tables 3.8 and 3.9 show that a large number of variables help to explain public/private choices in the direction predicted by hidden-information theory. Many of these variables are not plausibly related to preferences between debt and equity, adding support to the hypothesis that firms care independently about who provides the funds. This proposition receives strong support from table 3.9, which reports the analysis of private/public choices conditional on type of funding.

One further piece of statistical evidence is available concerning whether firms care who provides their funds. The inclusive value in choice tree 1 (table 3.8) concerns dissimilarities between alternative providers. Letting α be that coefficient, it can be shown that $1 - \alpha^2 = \text{corr}(V_{m,\text{debt}}, V_{m,\text{equity}})$, that is, the correlation between the values of funds sources that is peculiar to who provides the funds, rather than the type of funds. Thus, if $\alpha = 1$, there is no characteristic of the firm's unobservable preferences that distinguishes public from private sources of funds. The estimated α in this model is more than 25

Table 3.9 Nested Logit Analysis of Financing Choices (Choice Tree 2)

	Private/Public Debt (Private = 1, Public = 0)		Private/Public Equity (Private = 1, Public = 0)	
Variable	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Constant	5.13	8.24	5.81	15.6
Paying dividends	−1.09	−4.80	−.441	−4.02
VEARNA	6.37	3.10	−1.32	−1.60
Tax loss CF	.630	1.13	.871	2.20
Price change	−.0462	−.627	−.495	−8.69
Regulated	−.0301	−.0498	−1.14	−3.35
R&D	−12.2	−3.39	−8.62	−5.84
Advertising	−7.34	−2.96	−1.65	−1.05
Fraction plant	−1.55	−4.19	−.0242	−.108
Net assets	−1.10	−9.69	−.0438	−3.51
VEARNB	.0449	1.02	−.00119	−.595
ITC	5.49	.247	−5.20	−.669
ITC/ZPROB	−20.2	−.917	1.40	.235
1/ZPROB	.127	.595	.0276	.442
Debt/asset—average	.782	1.02	1.70	4.10
Debt/assets	−1.48	−2.49	−4.89	−14.8
Cash deficit	4.61	3.82	−.220	−.683
Observations	2356		12042	
Mean of dependent variable	.732		.931	
Log likelihood	−913.0		−2624.2	
Lerman's R^2	.441		.686	
Lerman's $\bar{R}^2$	.416		.681	
McFadden's R^2	.333		.133	

Note: The top branch choice between debt and equity is not reported for clarity. Those results are available from the author. Each branch was estimated with 10-year dummies and 15 industry dummies. The *t*-statistics are asymptotic.

standard deviations away from one, so we reject the hypothesis of no difference between types of providers with a high level of confidence. The conclusion is that firms do not view private and public sources as interchangeable.

3.5.2 Public Bonds or New Shares?

The first pair of columns in table 3.8 report the estimated effects of the explanatory variables on firm choices between issuing bonds or new shares, conditional on going public. This choice is the subject of MacKie-Mason (1990) and a similar set of results are discussed in detail in that paper. I will summarize only the main results here.

The evidence supports the importance of tax shield crowding out. Several variables indicate the likelihood of a firm being tax exhausted: tax-loss carryforwards, *ITC/ZPROB*, and *VEARNB*. Each of these has a significant coefficient indicating that firms likely to be tax exhausted are less likely to issue

debt. *VEARNA*, which was intended to primarily measure hidden-information problems, is also significant, with a sign consistent with its alternative interpretation as another indicator of the likelihood of tax exhaustion.

Firms with cash deficits are more likely to issue equity, again consistent with the firm's desire to avoid committed interest payments that might necessitate reducing the dividend. Viewed another way, firms with surplus cash are more likely to issue debt, which Jensen (1986) predicted as the appropriate way to control the moral-hazard problems from letting the managers have discretionary control over uncommitted cash flows.

Entered by itself, ITC is consistent with the theory that fixed physical assets can secure debt issues, but the plant and equipment fraction of assets and total assets both have no effect on the firm's preference for debt, so the evidence in favor of this moral hazard hypothesis is weak.

3.5.3 Summary

Many estimated effects have been discussed in this section. To summarize, it is useful to again refer to the predictions shown in table 3.7. Most of the predictions have been supported by the data, some quite strongly and robustly. Several variables expected to affect choice of provider but with no obvious importance for type of security indeed had the predicted signs and were significant. The results were obtained both for the private/public distinction in the entire sample (table 3.8) and for the private/public choice conditional on debt or equity financing (table 3.9).

The models fit the data reasonably well, considering the underdeveloped state of structural theory in this area. Lerman's R^2 statistic (which has the usual "explained variation" descriptive content as the R^2 in a linear regression) ranges from 0.44 to 0.69 in the private/public choice models. McFadden's R^2 measures the incremental contribution by the explanatory variables beyond a naive model that simply predicts the mean. This statistic is low but still substantial for a discrete-choice model. So much of the variation in the data is explained by the dominant use of retained earnings (93% of all equity choices) that there is not much left to explain after the naive model. Naturally much of the residual will not be explained by the descriptive proxy variables selected for the analysis. It is notable, however, that in the debt-only branch of choice tree 2 (table 3.9), in which the split between private and public is more balanced (73% private), the McFadden R^2 is 0.33, which is quite large for a discrete-choice model.

Thus, there still remains much to be learned about firm preferences for different sources of funds. But the evidence thus far is clear and strong that firms do care about who provides the funds, as distinct from the type of security.

3.6 Conclusion

This paper has presented data on the incremental financing behavior of U.S. nonfinancial corporations since 1945. The main conclusion is simple and is

reinforced with evidence throughout the paper: firms are concerned with who provides their financing, not just with the debt/equity distinction. Debt is more than just debt; equity is more than just equity.

Most optimal leverage theories in the literature have concerned solely the debt/equity distinction. Stated simply, firms are believed to balance the tax advantages, real bankruptcy cost disadvantages, and investment incentive inefficiencies of debt. More recently, the possibility that information asymmetries might affect financing decisions has received substantial attention. Hidden-information models explicitly direct our attention to distinctions other than the debt/equity choice. In particular, it becomes crucial to know who the parties providing the funds are and what information is available to them.

This paper has provided substantial evidence that hidden-information problems are important. In the aggregate there are large and persistent differences in the patterns of internal and external financing. Different industries—with different information characteristics—exhibit substantial variations in reliance on internal funds both over time and across industries. When the incremental financing decisions of individual firms were analyzed, we saw significant and coherent distinctions between the providers of funds.

Internal financing is different from external. Private financing is different from public. These facts should encourage more research into the nature of financial choices by firms and into the implications of hierarchical financing preferences and credit market constraints on investment and other firm activities.

Appendix

Table 3A.1 **Industry Definitions**

Code	SIC Coverage	Description
100	100–200	Agriculture
1000	1000–1200, 1400	Metal Mining, Coal, Miscellaneous Mining
1300	1300	Oil & Gas Mining
1500	1500–1700	Construction
2000	2000–2100	Food & Tobacco
2200	2200–2700	Textile Mills, Lumber, Furniture, Paper, Printing
2800	2800	Chemical & Allied
2900	2900	Petroleum Refining
3000	3000–3300	Rubber, Plastic, Leather, Stone. Clay, Glass, Primary Metal
3400	3400	Fabricated Metal
3500	3500	Machinery excluding Electrical
3600	3600	Electronics, Electrical Machinery
3700	3700	Transport Equipment
		Measuring Instruments, Photo, Watches,

(continued)

Table 3A.1 (continued)

Code	SIC Coverage	Description
3800	3800–3900	Miscellaneous Manufacturing
4000	4000–4400, 4600–4700	Ground, Water, & Miscellaneous Transport
4500	4500	Airlines
4800	4800	Communications
5000	5000–5100	Wholesale Trade
5200	5200–5900	Retail Trade
7000	7000–8999	Hotels, Entertainment, & Services

Notes

1. See, *e.g.*, Auerbach (1985), Bartholdy, Fisher and Mintz (1989), Bradley, Jarrell and Kim (1984), Long and Malitz (1985), Ang and Peterson (1986), and Williamson (1981).

2. In recent years a number of good overviews of capital structure theory have appeared. See, *e.g.*, Myers (1984), Auerbach (1985), Taggart (1985). I shall not provide a redundant development of the standard models.

3. Myers (1984) described his view as an eclectic, "modified pecking order theory," but did not integrate the elements into a careful model.

4. The literature on managerial capitalism (*e.g.*, Berle and Means 1932, Liebenstein 1966) suggests that managers act at least in part in their own interest, rather than in the interests of current shareholders. One effect of managerial opportunism on financing is examined in my discussion on the role of cash flow, in Sec. 3.4.

5. The discussion of aggregate sources of funds updates some of Raymond Goldsmith's flow-of-funds studies done for the National Bureau of Economic Research (Goldsmith 1956; Goldsmith, Lipsey, and Mendelson 1963).

6. The last cycle is shown to end in 1987 because more recent data were not available; the economy was still expanding at least into the middle of 1990.

7. See Shoven (1986) for a detailed look at repurchasing behavior.

8. Further, the averages he reports appear to be in error, although the discrepancy might be the result of revisions of the series by the Federal Reserve.

9. The temporary disappearance of a firm from an industry aggregate may have a substantial impact on levels of the variables, but will only affect the relative shares that are reported here inasmuch as that firm deviates substantially from the industry mean.

10. Earlier data were not collected because the other information needed for the econometric analysis is unavailable before 1977.

11. This sample misses the huge boom in initial public offerings during those years, because newly public firms are usually too small to be immediately covered by COMPUSTAT.

12. We must be careful about drawing inferences from relative financing shares. There is an important distinction between extent to which a firm relies on a particular source and the exposure of that firm to particular markets. Even a firm relying predominantly on internal sources may face the external market quite often. For example, firms in this industry on average provided 96.6% of their funds internally (table 3.4). However, these companies also obtained large amounts of debt financing: debt sources were equivalent to 30% of total sources during 1983–86 (table 3.5). The large influx of debt was offset by equally large share repurchases, with net new shares at −34%

during the period. Thus the industry provided 104% of total funds through internally generated cash, but the firms were heavily involved in external securities transactions as well. We cannot necessarily take high reliance on internal funds as measured above to be support for Donaldson's hypothesis that internal financing "avoids the glare of publicity and shareholder attention which accompanies the decisions and actions of management if externally financed" (1961, 54). In fact the financial decisions of petroleum firms were among the most publicized and scrutinized during recent years.

13. This structure avoids the problem of independence of irrelevant alternatives (IIA) that characterizes a better-known model, the multinomial logit. If IIA *were* imposed it would mean, for example, that the probability of choosing public equity over public debt would be unaffected by whether or not it was possible to use retained earnings. That is, internal equity would substitute identically for either public equity or public debt. The model I use avoids this implausibly extreme independence.

14. A more general model is the multinomial probit, which allows for any pattern of correlations among the choices. I attempted to estimate a multinomial probit model, but found it computationally infeasible for this sample. Each evaluation of the likelihood function requires the calculation of a triple integral. With about 14,000 observations and 30 iterations this procedure involved over 500,000 triple integrations for each estimation run. A further complication is that some of the covariances appeared to be poorly identified, possibly because about 80% of the choices were of one source (retained earnings).

15. For computational feasibility I used the sequential estimator, and calculated standard errors corrected for the two-stage method.

16. Because of the small size of the subsample that issued publicly, I made an effort to fill in as much missing COMPUSTAT data as possible for these observations by a hand search through Moody's Manuals and the firms' 10-K reports to the SEC. Public utilities were dropped because flow-of-funds data are not available for them on COMPUSTAT.

17. The SEC tape contains records for registrations beginning with 1974. However, the tape layout was changed in 1977 at which time the SEC tried to recode the old observations according to the new format. I discovered that the recoding was done incorrectly, and after discussions with programmers at the SEC I determined that it was not possible to recover any correct registration data for 1974–76.

18. One factor that might measure variation in flotation costs across firms and time is the size of the financing, since unit issue costs are known to vary with issue size. However, issue size is clearly endogenous, both because a firm may be able to make its public issues less frequently to reduce flotation costs and because the investment and the financing decisions will not be independent if asymmetric information is important. To avoid simultaneity bias I do not include issue size in my list of reduced form explanatory variables.

19. McDonald and Soderstrom (1988) study this question.

20. Electric utilities are another obvious industry in which to look for regulation effects because of the close regulatory oversight and the heavy and regular new financing undertaken. Unfortunately, Standard and Poor's does not provide the flow-of-funds data that I need for electric utilities in the COMPUSTAT data base.

21. Note that R&D is expected to indicate both future discretionary opportunities and the potential for hidden-information problems. As we shall see below, advertising and R&D can also be viewed as tax shields.

22. This would be the case in a simple model in which earnings changes are distributed normally and for firms with less than a 50% chance of bankruptcy. The critical point in the distribution, below which the firm is distressed, will be closer to the mean for weaker firms (higher probability) and thus a given shift in that critical point from an increased debt burden will add a greater portion of the distribution than for a firm

with only a small-tail probability of bankruptcy. Above a 50% chance of bankruptcy the effect becomes ambiguous in this simple model, but such instances are unlikely to be quantitatively important in my sample.

23. This measure has been effectively used in MacKie-Mason (1990), Bartholdy, Fisher and Mintz (1989), and Whited (1988).

24. The same effect would follow from a higher corporate tax rate, but there is no variation in the corporate tax rates during the sample period to identify a rate effect.

25. Auerbach and Poterba (1986) have noted that book tax-loss carryforwards may substantially mismeasure the actual loss carryforwards available to the firm for tax purposes. This problem with the data was discussed in MacKie-Mason (1990). Also in that paper, a short corrected time series constructed by Auerbach and Poterba was tested with no discernible effect on the results of estimating the choice between public debt and equity issues.

26. For example, Titman and Wessels (1988), Ang and Peterson (1986), Long and Malitz (1985), Bradley, Jarrell and Kim (1984), Marsh (1982), and Williamson (1981).

27. See the example above in n. 22 and the related text discussion.

28. This point is discussed in MacKie-Mason (1990).

29. Coefficients were also estimated for each year and 15 industry dummies to control for time and fixed industry effects; these results and the omitted branch results are available from the author.

30. There was substantial deregulation for most of these firms during the sample period, but none of these industries have been completely deregulated.

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